



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,249	09/01/2005	Abbas Razavi	F-861 (31223.00078)	4021
25264	7590	01/25/2007		
FINA TECHNOLOGY INC PO BOX 674412 HOUSTON, TX 77267-4412			EXAMINER	
			LEE, RIP A	
			ART UNIT	PAPER NUMBER
			1713	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/529,249

Applicant(s)

RAZAVI, ABBAS

Examiner

Rip A. Lee

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-41 is/are pending in the application.
- 4a) Of the above claim(s) 29 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 21-28 and 31-41 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>08-15-2005 (2)</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Election/Restrictions

1. This application contains claims directed to the following patentably distinct species:

(i) a catalyst system and process of use comprising a hafnocene-based component and at least one other metallocene component, described in claims 21-30 and 32-41 and (ii) a catalyst system and process of use comprising hafnocene-based component and at least one other post-metallocene component, described in claims 21-28 and 31-41. The species are independent or distinct because these represent two chemically distinct materials and processes.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claims 21 and 39 are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

2. During a telephone conversation with William D. Jackson on December 14, 2006, a provisional election was made with traverse to prosecute the invention of species (ii), drawn to a catalyst containing hafnocene-based component and at least one other post-metallocene component claims. Affirmation of this election must be made by applicant in replying to this Office action. Claims 29 and 30 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

3. Claims 1, 39, and 41 are objected to because of the following informalities: The claim recites the term “molecular weight” without defining the type of molecular weight (molar mass, weight average molecular weight (M_w), number average molecular weight (M_n), *etc.*). As such, the scope of the claims is unclear. *Ex parte Simpson*, 61 USPQ2d 1009 (BPAI, 2001). Appropriate correction is required.

4. Claim 24 is objected to because of the following informalities: It appears that use of the term “non-hydrogen substituent” should be used in the claims because claim 22, from which claim 24 depends, indicates that substituent R may be hydrogen. Appropriate correction is required.

5. Claims 24 and 25 are objected to because of the following informalities: Ring positioning recited in the claims is arbitrary unless it is indicated that hafnocene complexes are bridged, *i.e.*, $s = 1$. Appropriate correction is required.

6. Claim 28 is objected to because of the following informalities: Group X is not defined consistently because group X is defined as a ligand that contains a heteroatom, rather than the heteroatom itself; see claim 22. Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1713

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 21-28 and 32-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimura *et al.* (U.S. 6,136,743).

Sugimura *et al.* teaches a catalyst composition comprising (1,3-Me₂Cp)₂HfCl₂ and (2,6-*i*Pr₂Ph)₂(N=C(Me)-C(Me)=N)NiBr₂ (designated compound (2)) and MAO for polymerization of ethylene propylene (example 3, col. 70). The mole ratio of Hf/Ni is 1/5, corresponding to 12 wt % of hafnocene, based on the total amount of both metal complexes. The catalyst is used in a process for polymerizing ethylene propylene (example 3, col. 70). There is no example in the reference in which MAO is replaced with a borate activator. Sugimura *et al.* teaches that aluminoxanes may be replaced with conventional ionic borates since the latter are well known in the art as functionally equivalent activator (see discussion, col. 44 – col. 47). Moreover, ionic borates are well suited for generating the active species for post-transition metal complexes, as explained in col. 52 – col. 54 and shown in example 1. It would have been obvious to one having ordinary skill in the art, in absence of any showing of criticality or unexpected results, to replace aluminoxane with an ionic borate because Sugimura *et al.* teaches that borates activators are functionally equivalent to aluminoxanes, and one of ordinary skill in the art would have expected functionally equivalent activator to produce a working catalyst with a reasonable expectation of success. The combination is obvious especially in view of the teaching that post-metallocene catalysts are routinely prepared using borate activator. In sum, the subject matter of claims 21-25, 36, 37, 39, and 40 are obvious in view of the cited example of the prior art.[†]

That a high molecular weight polyolefin fraction is produced by the hafnocene-based component and a low molecular weight fraction is produced by the post-metallocene component is not expressly stated in Sugimura *et al.* However, the catalyst components are essentially the same as that recited in the instant claims, and thus, one of ordinary skill in the art would reasonably expect each type of catalyst would result in the formation of essentially the same type of polyolefin component.[†] Also, regarding claim 41, the prior art does not disclose the weight fraction of polymeric components in the final product. However, in view of the fact that the process where aluminoxane is replaced with borate activator is substantially the same as that recited in the claims, one having ordinary skill in the art would have reasonably expected such a catalyst to produce a product that is substantially the same as that claimed. Since the PTO can not perform experiments, the burden is shifted to the Applicants to establish an unobviousness difference. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

The subject of claims 32-35 is obvious over the teachings in Sugimura *et al.* Use of organoaluminum as additional co-catalyst is taught in col. 47 – col. 48. Details on use of fine particulate carrier appear in col. 50, lines 8-22; the preferred carrier is silica having a surface area of 100-700 m²/g and a pore volume of 0.3-2.5 cm³/g. One having ordinary skill in the art would have found it obvious to make a catalyst with these components because their use is taught in the prior art. The subject matter of claims 24-28 is also obvious over Sugimura *et al.* Representative bridged, variously substituted *biscyclopentadienyl* and *bisindenyl* complexes (bridge is ethylene or dimethylsilylene) are listed throughout the text, and although only zirconium compounds are exemplified, one of ordinary skill in the art, in absence of any showing of criticality or unexpected results, would have found it obvious to use analogous hafnium-based

[†] Regarding claims 24 and 25, it is noted that ring positioning is arbitrary; see claim objections, paragraph 4, *supra*.

[‡] It is well-established in early-late transition metal dual catalyst systems that late metal complexes produce low molecular weight fraction due in part to a series of hydride elimination, hydride re-addition sequences; see discussion in Eilerts *et al.* (U.S. 6,291,608). Also, hafnocenes are known to produce higher molecular weight product compared with their zirconocene analogues; see Winter *et al.* (U.S. 5,679,811).

compounds, and thereby arrive at the subject matter of claims 24-28, because Sugimura *et al.* teaches use of group 4 metallocenes, which include compounds containing hafnium. Thus, it would have been obvious to use the corresponding hafnocenes since these are well-known species of the genus of group 4 metallocenes. One having ordinary skill in the art would have expected all species within the genus to produce a productive catalyst.

Sugimura *et al.* discloses that the mole ratio of metal components is variable: molar ratio of late metal complex to the total of transition metal lies in the range of 0.05-2000 (col. 55, lines 36-39), and it can be seen in the examples that this ratio may be varied to produce a particular molecular weight distribution of polymer. It would have been obvious to one having ordinary skill in the art to arrive at the molar ratio prescribed in claim 38 of the present claims in order to optimize the molecular weight distribution of the polymer product. Moreover, it has been deemed that the discovery of optimum values of result-effective variables in a known process is within the level of ordinary skill in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

10. Claims 21-27, 32, 33, and 36-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Canich *et al.* (U.S. 6,194,341) in view of Winter *et al.* (U.S. 5,679,811).

Canich *et al.* discloses a process of polymerization of olefin in the presence of a mixed transition metal catalyst system comprising one late transition metal component, one early transition metal, metallocene component, and at least one activator containing $[B(C_6F_5)]$ anion (claims 1-9). Another aspect of the invention is drawn to supported catalysts (claim 16). One embodiment of the invention is use of a dual catalyst for making various types of polypropylene blends in a single reactor: the metallocene is used to make high molecular weight stereoregular polypropylene and the late transition metal is used to make atactic polypropylene which resembles propylene/ethylene copolymer. By varying the amounts of polymers in the blend, it is possible to make thermoplastic polyolefin, impact copolymer, or thermoplastic elastomer (col. 19, lines 5-20). This process is shown in examples M8 (col. 35). Here, $Me_2Si(ThInd)_2ZrCl_2$ is used to make the isotactic polypropylene component.

Canich *et al.* provides a listing of representative metallocenes useful for the invention is provided in column 6, lines 2-26. There is mentioned use of $\text{Me}_2\text{Si}(\text{C}_5\text{Me}_4)(\text{C}_{12}\text{H}_{24}\text{N})\text{HfH}_2$ and $\text{Me}_2\text{Si}(\text{Ind})_2\text{HfMe}_2$, but the reference does not show examples in which these are used as metallocene component of the dual catalyst. Winter *et al.* teaches that hafnium-based metallocenes such as $\text{Me}_2\text{Si}(\text{Ind})_2\text{HfCl}_2$ are useful for making stereoregular polypropylene with the advantage that hafnocenes produce higher molecular weight product compared with their zirconocene analogues (col. 1, lines 60-62). One skilled in the art appreciates the benefits of using high molecular weight stereoregular polypropylene for making thermoplastic polyolefin and impact copolymer. Based on the teachings of Winter *et al.*, it would have been obvious to one having ordinary skill in the art to use the $\text{Me}_2\text{Si}(\text{C}_5\text{Me}_4)(\text{C}_{12}\text{H}_{24}\text{N})\text{HfH}_2$ and $\text{Me}_2\text{Si}(\text{Ind})_2\text{HfMe}_2$ in the catalyst of Canich *et al.* in order to make a polymer blend having high molecular weight polypropylene. The combination is obvious because Canich *et al.* already suggests use of hafnocenes, and Winter *et al.* shows the benefits of their use as catalyst component. And although the examples show use of MAO as the activator, one having ordinary skill in the art, in absence of any showing of criticality or unexpected results, would have found it obvious to use activator containing $[\text{B}(\text{C}_6\text{F}_5)]$ anion because use of this type of activator is specifically proposed by the inventors.

Canich *et al.* does not specify a particular mole ratio of transition metal components. For the exemplified dual catalyst M8, the amount of metallocene is not more than 50 wt%. It may be gleaned from the text that the mole ratio of metal complexes may be varied to produce the desired type of polymer product (thermoplastic polyolefin or impact copolymer or thermoplastic elastomer; col. 19, lines 5-20). It would have been obvious to one having ordinary skill in the art to arrive at the molar ratios prescribed in claims 36-38 of the present claims in order to optimize the molecular weight distribution of the polymer product. Moreover, it has been deemed that the discovery of optimum values of result-effective variables in a known process is within the level of ordinary skill in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

The subject of claims 32-35 is obvious over the teachings in Canich *et al.* Use of trialkylaluminum as scavenger is taught in column 11, lines 10-12; trialkylaluminum would inherently act as co-catalyst. The inert support is MS948 silica having a pore volume of 1.66 cm³/g (col. 23, line 3). The surface area is not indicated however, in view of the fact that surface area and pore volume are related, and in light of the fact that the claimed range is unexceptional, one having ordinary skill in the art would have found it obvious that the MS948 silica also possesses the claimed surface area. Since the PTO can not perform experiments, the burden is shifted to the Applicants to establish an unobviousness difference. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Also, regarding claim 41, the prior art does not disclose the weight fraction of polymeric components in the final product. However, in view of the fact that the process where zirconocene is replaced with hafnocene is substantially the same as that recited in the claims, one having ordinary skill in the art would have reasonably expected such a catalyst to produce a product that is substantially the same as that claimed. Again, the burden is shifted to the Applicants to establish an unobviousness difference since the PTO can not conduct experiments.

11. Claims 21-24, 31, 34, and 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mecking (DE 198 23 871).

Mecking teaches a catalyst comprising a late transition metal component and an early transition metal component (claim 1) for polymerization of olefins. The late metal complex contains a pyridine *bisimine* ligand (III) and contains group 8 triad metals (claims 5 and 7). Useful complexes include [(2,6-*i*Pr₂Ph)₂(N=C(Me))(pyridine)FeBr₂ (page 4, line 24) and the corresponding dichloride complex, [(2,6-*i*Pr₂Ph)₂(N=C(Me))(pyridine)FeCl₂ (Example 13). The early metal component is a metallocene or constrained geometry metallocene complex (claims 8-10). Hafnium-based compounds such as (Me₂Cp)₂HfCl₂, (BuCp)₂HfCl₂, CH₂(BuCp)HfCl₂, and CH₂(Cp)₂HfCl₂ are suggested (page 7, lines 7-11). An activator is required, and aluminoxanes or ionic borates which are conventionally used in the art are described on page 7, lines 17-21.

Example 13 of Mecking shows a catalyst comprising [(2,6-*i*Pr₂Ph)₂(N=C(Me))(pyridine)FeCl₂, (BuCp)₂ZrCl₂, and MAO, but, it does not show a catalyst comprising all the elements cited in the instant claims. However, it would have been obvious to one having ordinary skill in the art, in absence of any showing of criticality or unexpected results, to use the corresponding hafnium derivative, (BuCp)₂HfCl₂, since the prior art shows that hafnium complexes are suitable for catalysts of this invention and that they are interchangeable with zirconium complexes. It also would have been obvious to one having ordinary skill in the art, in absence of any showing of criticality or unexpected results, to replace aluminoxane with an ionic borate because Mecking also teaches that borates activators are functionally equivalent to aluminoxanes, and one of ordinary skill in the art would have expected functionally equivalent activator to produce a working catalyst with a reasonable expectation of success. Regarding claim 34, one having skill in the art would have found it obvious to use the catalyst with an inert support because supported catalysts are one embodiment of the invention of Mecking (see claim 12). Also, regarding claim 41, the prior art does not disclose the weight fraction of polymeric components in the final product. However, in view of the fact that the process where zirconocene is replaced with hafnocene is substantially the same as that recited in the claims, one having ordinary skill in the art would have reasonably expected such a catalyst to produce a product that is substantially the same as that claimed. Since the PTO can not perform experiments, the burden is shifted to the Applicants to establish an unobviousness difference. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Prior Art

11. An international search report for Applicant's 2004/029101 has cited Sugimura *et al.* (EP 893 455; equivalent document U.S. 6,136,743, *supra*) and Ewen (U.S. 4,975,403) as "X" references. Applicants have amended claims of the present invention to include borate, boronate, or aluminate activator. As such, examiner finds that the prior art does not anticipate the subject matter of the instant claims. Ewen teaches a catalyst comprising two metallocenes. The subject matter of the prior art does not apply to the elected claims.

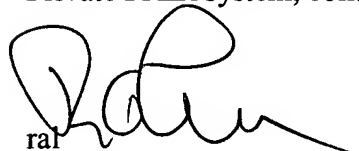
Drawings

12. Figure 1 is objected to because the text has been hand-written. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Art Unit: 1713

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rip A. Lee whose telephone number is (571)272-1104. The examiner can be reached on Monday through Friday from 9:00 AM - 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached at (571)272-1114. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <<http://pair-direct.uspto.gov>>. Should you have questions on the access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).



ral

January 19, 2007